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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/692,301	10/23/2003	Vincent R. Farnsworth	6320P0020US	7345

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EXAMINER	
QUASH, ANTHONY G	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 05/26/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/692,301	FARNSWORTH, VINCENT R.	
	Examiner	Art Unit	
	Anthony Quash	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *9-15* is/are allowed.

6)☒ Claim(s) *1-8,16-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *10/23/03; 4/15/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 are rejected under 35 U.S.C. 102(b) as being anticipated by Bakker [3,634,683]. Bakker [3,634,683] discloses a time-of-flight mass analyzer comprising an ionizer (1) adapted to provide ions of a sample substance to be analyzed, a flight tube (figs. 1-2. col. 1 lines 5-35, 60-70, col. 2 lines 50-75, and col. 7 lines 5-40) accepting ions provided from the ionizer, the flight tube adapted to constrain the ions to a substantially helical ion flight path using a generally static electric field, an ion detector (5) disposed to detect ions exiting the flight tube, and at least one timer adapted to determine the flight time of the ions along an ion path that comprises at least the substantially helical ion path. Bakker [3,634,683] also discloses the ionizer being integrated with the flight tube, and the helical ion path being defined by a linear axis, the ions being provided to the flight tube with a velocity component in the direction of the linear axis. See Bakker [3,634,683] (figs. 1-2. col. 1 lines 5-35, 60-70, col. 2 lines 50-75, col. 3 line 50 – col. 4 line 10, and col. 7 lines 5-40).

Claims 1-3 are rejected under 35 U.S.C. 102(e) as being anticipated by Glukhoy [6,791,079]. With respect to claims 1-3, Glukhoy [6,791,079] discloses a time-of-flight mass analyzer comprising an ionizer (30) adapted to provide ions of a sample substance to be analyzed, a flight tube (28) accepting ions provided from the ionizer (30), the flight tube (28) adapted to constrain the ions to a substantially helical ion flight path (abstract, figs. 1-3,7) using a generally static electric field, an ion detector (42-1,42-2) disposed to detect ions exiting the flight tube (28), at least one timer (col. 10 lines 5-15) adapted to determine the flight time of the ion along an ion path that comprises at least the substantially helical path. It also discloses the ionizer (30) being integrated with the flight tube (28), and the substantially helical path being defined by a linear axis, the ions being provided to the flight tube (28) with a velocity component in the direction of the linear axis. See Glukhoy [6,791,079] abstract, figs. 1-4,7, col. 1 lines 20-55, col. 2 lines 45-65, col. 3 liens 1-16, col. 4 lines 5-15, 50-55, col. 5 lines 30-60, col. 6 lines 20-67, col. 7 lines 1-35, 45-50, col. 8 lines 1-5, 10-15, 30-45, 55-67, col. 9 lines 1-5, 10-20, 35-47, and col. 10 lines 5-15, 30-50.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ulbricht [4,490,610]. With respect to claims 1-3, Ulbricht [4,490,610] teaches a time-of-flight mass analyzer comprising an ionizer (5) adapted to provide ions of a sample to be analyzed, a flight tube (22) accepting ions provided from the ionizer (5), the flight tube adapted to constrain the ions to a substantially helical ion path using a generally static electric field (figs. 1-3, col. 4 lines 5-30), an ion detector (7) disposed to detect ions exiting the flight tube (22). It also teaches the ionizer (5) being integrated with the flight (22), and the helical path being defined by a linear axis, the ions being provided with a velocity component in the direction of the linear axis. See Ulbricht [4,490,610] figs. 1-3, col. 3 lines 30-50, col. 4 lines 5-30, and col. 6 lines 20-35. However, Ulbricht [4,490,610] does not explicitly state there being at least one timer adapted to determine the flight time of the ion along an ion path that comprises at least the substantially helical ion path. Ulbricht [4,490,610] does however infer this when it states, "The detector signals the precise arrival time of each ion." See Ulbricht [4,490,610] col. 4 lines 10-30 and col. 6 lines 20-35. Therefore the examiner recognizes the equivalence of the detector (28) for detecting time/arrival time of the ions and the timer claimed by the applicant for their use in detecting the time-of-flight of ions.

Claims 1-3,6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Weiss [6,828,553] in view of Glukhoy [6,791,079]. With respect to claims 1-3, Weiss [6,828,553] teaches a time-of-flight mass analyzer comprising an ionizer (ESI, col. 6 lines 50-65) adapted to provide ions of a sample substance to be analyzed, a flight tube (figs. 1-5) accepting ions provided from the ionizer (ESI), the flight tube adapted to

constrain the ions to a substantially helical ion flight path using a generally static electric field, an ion detector (43) disposed to detect ions exiting the flight tube. See Weiss [6,828,553] abstract, figs. 1-5, col. 2 lines 25-31, 50-60, col. 3 lines 10-20, col. 5 lines 1-50, col. 6 lines 5-10, 25-30, 50-65, col. 7 lines 1-5, 20-36, 46-65, col. 8 lines 5-11, 60-65, and col. 9 lines 5-10. However, Weiss [6,828,553] does not explicitly state the device having at least one timer adapted to determine the flight time of the ion along a path that comprises at least the substantially helical ion path. Glukhoy [6,791,079] does however teach at least one timer adapted to determine the flight time of the ion along a path that comprises at least the substantially helical ion path. See Glukhoy [6,791,079] col. 1 lines 25-45, and col. 10 lines 5-15. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have at least one timer adapted to determine the flight time of the ion along a path that comprises at least the substantially helical ion path since it was well know in the art to have a timer or timing device to detect the arrival of individual clusters of ions having different masses.

As per claim 6, Weiss [6,828,553] teaches an inlet portion having an ion inlet portion being substantially free of electric fields (col. 2 lines 20-31, figs. 2-5), and an ion deflection portion having a substantially static electric field, the ion deflection portion being adapted to direct ions received from the inlet portion along the substantially helical ion flight path. See Weiss [6,828,553] abstract, figs. 2-5, col. 1 lines 5-30, col. 2 lines 20-31, col. 3 lines 14-18, col. 5 lines 3-51, col. 6 lines 25-32, 50-65, col. 7 lines 20-32, col. 8 lines 7-12, col. 9 lines 5-10.

Claims 4-5,16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bakker [3,634,683]. With respect to claims 4-5, Bakker [3,634,683] teaches all aspects of the claims except for explicitly stating the ions being provided to the flight tube with a negligible velocity component in the direction of the linear axis whereby the ions initially remain circulating in a region proximate an input of the flight tube, and an electrode disposed for use in generating an electric field that imparts a velocity component in a direction along the linear axis to the ions whereby the ions move away from the region proximate the input of the flight tube. Bakker [3,634,683] does however teach a pulse generator (7), which the examiner recognizes for providing an electric field that imparts a velocity component in a direction along the linear axis to the ions whereby the ions move away from the region proximate the input of the flight tube. See Bakker [3,634,683] figs. 1-2, col. 2 lines 50-75. As for the applicant's claim concerning the ions being provided to the flight tube with a negligible velocity component in the direction of the linear axis whereby the ions initially remain circulating in a region proximate an input of the flight tube, it is the examiner's view that this would have been obvious to one of ordinary skill in the art at the time the invention was made in order to allow one to use the concentric electrode as a storage ring for ions.

As per claim 6-8,16, Bakker [3,634,683] teaches all aspects of the claims except for explicitly stating the inlet portion having an ion inlet, wherein the inlet portion is substantially free of electric fields. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have the inlet portion have an ion inlet, wherein the inlet portion is substantially free of electric fields in order to allow the ions to

enter the tube at velocity along the axis so that the ions would separate according to mass (wherein ions of lighter masses arrive at the detector, located at the end of the tube, sooner than ions of heavier masses) as is well known in the art for time-of-flight mass spectrometers. In addition, Bakker [3,634,683] teaches at least one power supply connected to the flight tube to generate a first generally static electric field in the ion deflection portion, the power supply further being alternately operable between at least a first state in which the inlet portion is substantially free of electric fields, and a second state in which a second generally static electric field is generated in the inlet portion. Bakker [3,634,683] also teaches the first and second generally static electric fields having substantially the same magnitude. See Bakker [3,634,683] figs. 1-2, col. 3 line 50 – col. 4 line 10, and col. 7 lines 5-35.

Claims 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bakker [3,634,683] in view of Park [5,861,623]. With respect to claims 17-18, Bakker [3,634,683] teaches a method of routing ions in a time-of-flight mass analyzer comprising introducing the ions to an ion path, at least a portion of the ion flight path being defined by a linear axis, directing ions introduced to the ion flight path into a region of the ion flight path that has a substantially static electric field, providing the ions with a velocity component along the linear axis the ions making multiple circumnavigating trips along a path. It also teaches the ions traveling along a substantially helical ion flight path when provided with the velocity component along the linear axis. See Bakker [3,634,683] abstract, figs. 1-2, col. 1 lines 5-40, col. 2 lines 50-75, col. 3 lines 50-75, col. 4 lines 1-10, and col. 7 lines 5-37. However, Bakker

[3,634,683] does not explicitly state the substantially static electric field having non-linear equipotential field lines that circumvent the linear axis, and the path being defined by the non-linear equipotential field lines as the ions further travel in the direction of the linear axis. Park [5,861,623] does teach the substantially static electric field having non-linear equipotential field lines that circumvent the linear axis, and the path being defined by the non-linear equipotential field lines as the ions further travel in the direction of the linear axis. See Park [5,861,623] abstract, col. 1 lines 40-65, col. 2 lines 45-55, and col. 11 lines 25-41. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the substantially static electric field have non-linear equipotential field lines that circumvent the linear axis, and the path being defined by the non-linear equipotential field lines as the ions further travel in the direction of the linear axis in order to accelerate ions, improve flight time focusing and thereby increase mass resolution as taught in Park [5,861,623].

Claims 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bakker [3,634,683] in view of Park [5,861,623]. With respect to claims 19-22, Bakker [3,634,683] teaches a time-of-flight mass analyzer comprising, an ionizer adapted to generate ions of a sample substance to be analyzed, a flight tube having at least one linear portion defined by a linear axis, the flight tube further having an input region accepting ins generated by the ionizer, the flight tube adapted to constrain he ions in a substantially static electric field, an electrode disposed for use in generating an electric field that imparts a velocity component along the linear axis to the ions whereby the ions move away from the input region of the flight tube, an ion detector disposed to detect

ions exiting the flight tube, at least one timer adapted to determine the flight time of the ions along an ion path that comprises at least the flight tube. It also teaches the ionizer being integrated with the flight tube, and the ions traveling along a substantially helical ion flight path. See Bakker [3,634,683] abstract, figs. 1-2, col. 1 lines 5-40, col. 2 lines 50-75, col. 3 lines 50-75, col. 4 lines 1-10, and col. 7 lines 5-37. However, Bakker [3,634,683] does not explicitly state the static electric field having non-linear equipotential field lines that circumvent the linear axis, nor the ions making multiple circumnavigating trips along a path defined by the non-linear equipotential field lines as the ions further travel in the direction of the linear axis. Park [5,861,623] does teach the static electric field having non-linear equipotential field lines that circumvent the linear axis, and the ions making multiple circumnavigating trips along a path defined by the non-linear equipotential field lines as the ions further travel in the direction of the linear axis. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to have the static electric field have non-linear equipotential field lines that circumvent the linear axis, and the ions making multiple circumnavigating trips along a path defined by the non-linear equipotential field lines as the ions further travel in the direction of the linear axis in order to accelerate ions, improve flight time focusing and thereby increase mass resolution as taught in Park [5,861,623]. With respect to the applicant's claim concerning the ions being provided to the input region of the flight tube at an angle that is tangential to the equipotential field times of the substantially static electric field to thereby initially trap the ions in the input region of the flight tube, it is the examiner's view that it would have been obvious to one

of ordinary skill in the art at the time the invention was made to do this in order to allow the storage of ion clusters while waiting for ions from a preceding trial to cross the flight tube and be detected by the detector, thereby preventing lighter ion clusters from a second trial being detected at the same time as heavier ion clusters from a preceding first trial.

Allowable Subject Matter

Claims 9-15 allowed over the prior art of record.

The following is a statement of reasons for the indication of allowable subject matter: With respect to independent claim 15, and dependent claim 9, the prior art of record does not explicitly disclose nor teach a flight tube for a time-of-flight mass analyzer comprising a first electrode having a generally cylindrical electrode surface facing an interior portion thereof, the first electrode further having an ion inlet disposed through a side thereof, a second electrode having a generally cylindrical electrode surface facing an exterior portion thereof, the second electrode being concentrically disposed with the first electrode, the second electrode further having an opening along an arcuate portion of the electrode surface in a region to form an ion inlet, and a third electrode having an arcuate electrode surface facing an exterior portion thereof, the third electrode being disposed in the arcuate opening of the second cylindrical electrode, in combination with the remaining aspects of the claims.

Claims 10-14 are allowable due to their dependence on claim 9.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent Nos. 5,886,346 to Makarov, 6,794,647 to Farnsworth et al, and 6,791,077 to Farnsworth are considered pertinent to the applicant's disclosure. Makarov [5,886,346] is considered pertinent due to its discussion on a mass spectrometer (see fig. 3). Farnsworth [6,794,647] is considered pertinent because of its discussion on a mass analyzer having improved mass filter and ion detection arrangement (see fig. 3). Farnsworth [6,791,077] is considered pertinent due to its discussion on a mass analyzer allowing parallel processing one or more analytes (see fig. 4).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Quash whose telephone number is (571)-272-2480. The examiner can normally be reached on Monday thru Friday 9 a.m. to 5 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John R. Lee can be reached on (571)-272-2477. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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